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RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
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VOL. XV JULY, 1920 No. 4

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

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RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL XV JULY, 1920 No. 4

RADIUM TREATMENT OF ENLARGED THYMUS GLANDS IN INFANTS*

By ARTHUR C. HEUBLEIN, M.D.

Visiting Roentgenologist Hartford Hospital, Hartford, Conn.

Until a short time ago inexplicable deaths in infants were in many instances erroneously attributed to a variety of causes, such as status lymphaticus (exclusive of status thymicus), foreign body in the throat, suffocation by the mother during sleep, or having a cat suck its breath.

In our present knowledge the above named causes of sudden death are now known to be due, in the majority of cases, to a pathological overgrowth of the thymus gland. According to Sajous,[1] in most instances of thymic death, the victim is a child found dead in bed, doubtless as a result of asphyxia due to tracheal stenosis, laryngeal spasm, or cardiac paralysis with an enlarged thymus found at autopsy, as sole evidence. Such cases may be the source of unwarranted accusations of criminal suffocation and an autopsy should always be performed if possible.

This gland normally occupies the anterior and upper part of the mediastinum, is encased in a rigid structure, the thoracic wall, and when enlarged presses on the trachea, the recurrent laryngeal and vagus nerves, the great vessels of the upper thorax and lower cervical region, and the right auricle.

Directly or indirectly, this overgrowth is the cause of sudden death in a great many infants. Unfortunately enlargement of the thymus gland has been, and continues to be today frequently overlooked. Although the patient may have no gross symptoms of thymic enlargement it may exist, and if unrecognized is a menace to life. Many infants die yearly

*Reprinted from the American Journal of Roentgenology, vii, 191-195, April, 1920.

as a result of heart shock during anesthesia. Before submitting an infant to an operative procedure demanding a general anesthetic, the previous history, and a thorough chest examination should be obtained, and in all suspecious cases, roentgenographs made.

Prior to the period when roentgen treatment of the disease became a recognized entity, benzoin and the croup kettle were freely used, the mother becoming expert in the technique of artificial respiration, and the attending physician calling at frequent intervals to see if the infant were still alive. Thanks to the ever increasing alertness of the pediatrician, and to the development of the x-ray as a diagnostic agent, there should be no excuse for this condition escaping recognition. Unfortunately it still does except in a few medical centers where this disease is looked for as a matter of routine. Its prevalence is well illustrated by Friedlander, [2] who states that in Dr. Benjamin's Out-Patient Clinic in Cincinnati, of all the new patients admitted during the year, namely 225, 8.4 per cent were indisputable thymus cases.

There are many theories as to the etiology of thymic enlargement, but as yet no definite cause can be assigned. Pathologists tell us that it is a simple hyperplasia of all the elements of the gland.

In November, 1919, Edward A. Park and Roy D. McClure [3] of Baltimore reported a series of experiments on dogs. The conclusions of their exhaustive investigation are as follows:

1. The thymus gland is not essential to life in the dog.

2. Extirpation of the thymus produces no detectable alteration in the hair, teeth, contour of the body, muscular development, strength, activity or intelligence of the experimental animal.

3. Extirpation of the thymus probably does not influence growth or development. The possibility that it may cause retardation in development and delayed closure of the epiphyses, however, cannot be excluded absolutely.

4. Extirpation of the thymus probably produces no alterations in the organs of internal secretion. It is possible that it produces well-marked changes in the organs of internal secretion in the period immediately following thymectomy which was not covered in their experiments.

Briefly, the symptoms of enlarged thymus may be divided into two groups, general and local. The former are muscular hypotonus, eczema, lack of resistance to acute infectious diseases, and convulsions. The latter consist of those symptoms arising from interference with respiration and deglutition due to the mechanical effect of the enlarged gland. They vary from a slight cough to profound dyspnea with or without associated cyanosis. The respirations are usually audible, and when dyspnea is severe there may be a distinct inspiratory "crow." These symptoms may be precipitated or aggravated by exertion, such as crying, feeding, fright or by extension of the neck.

The diagnosis is made by the history, the physical examination, and the final and most accurate evidence, the roentgenogram. Inspection often shows a flabby child with retraction of the abdomen and intercostal muscles, with a bulging of the upper and anterior chest. Light percussion reveals an area of dullness to either side and continuous with the dullness over the sternum. It is usually more pronounced on the left side.

The roentgenograms show a shadow over-lying and continuous with

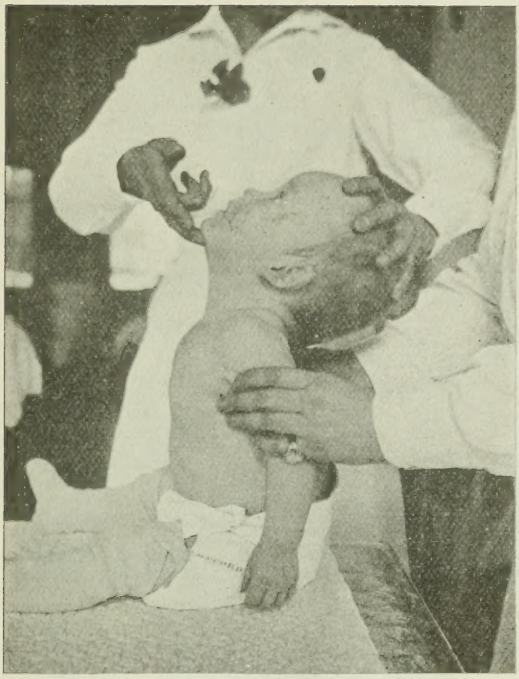

Fig. 1. Illustrating Bulging of Anterior and Upper Chest and Eczema which Frequently Accompanies this Disease.

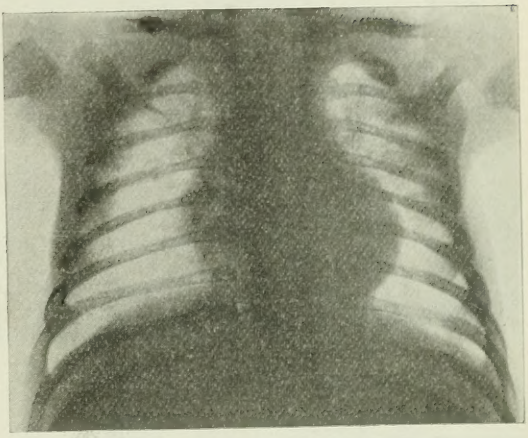

Fig 2. Normal Thymus Shadow.

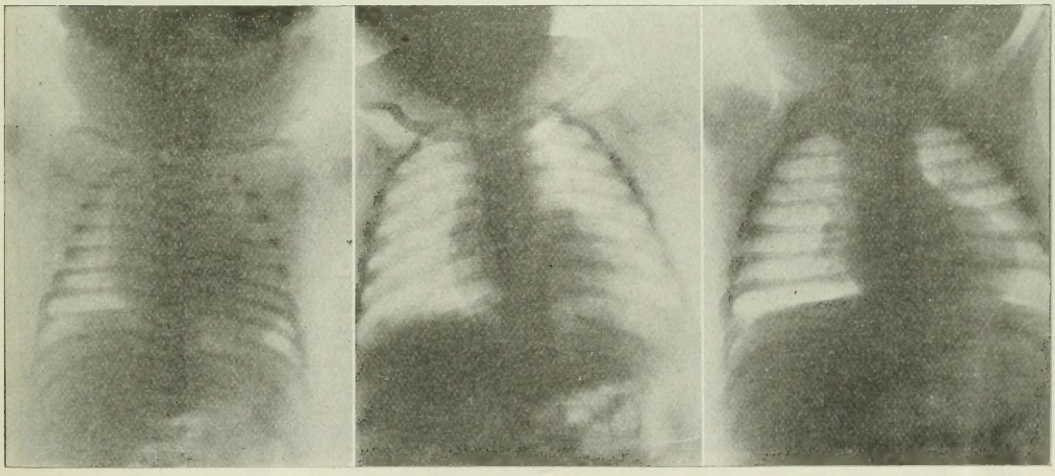

Fig. 3. Case I. Before Treatment Two Weeks After Ten Weeks After

the shadow of the heart and great vessels. Its margins are usually convex, more prominent on the left than the right side, and extending upward beneath the clavicles, blending with the tissues of the neck.

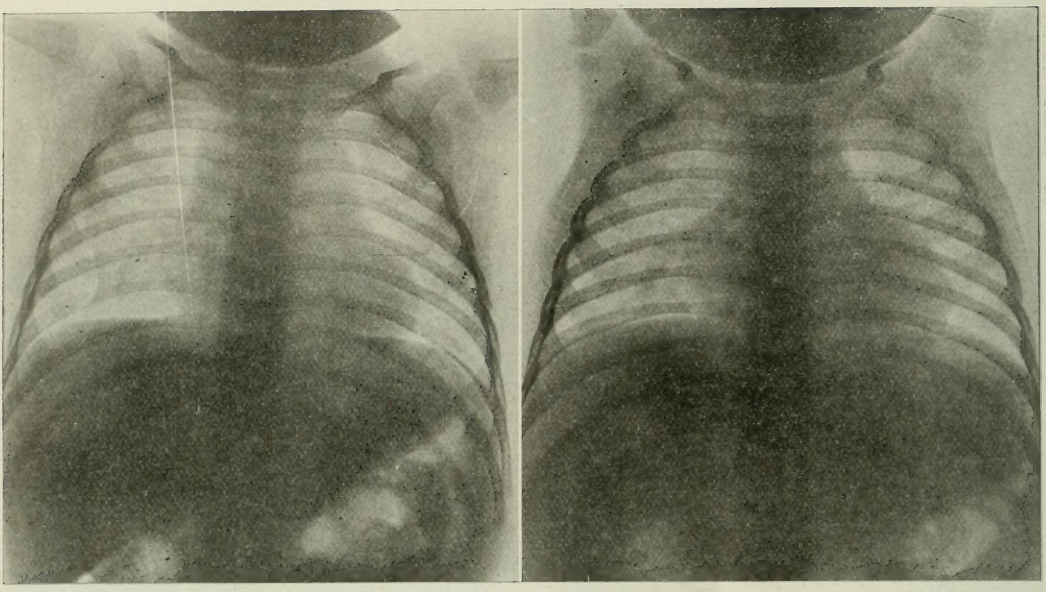

Fig. 4. Case 2. Before Treatment. One Week Later.

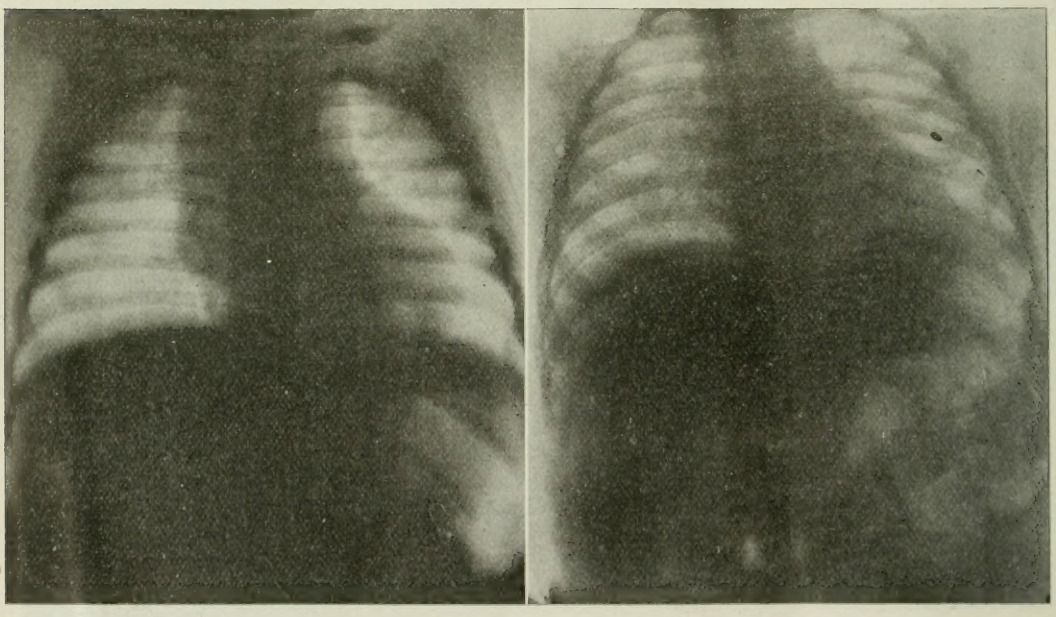

Fig. 5. Case 3. Before Treatment. One Week Later.

To date I have treated 41 cases, 34 of which Dr. Brayton and I reported in the December number of the *Boston Medical and Surgical Journal.* [4] In this series a constant technique was observed in producing

the roentgenographs. The patient was placed flat on the back, and a series of plates were made at a constant target plate distance until a plate was obtained which showed no distortion. Speed is an important factor, and of late I have found the double screen technique the most satisfactory.

A little over two years ago I was called in consultation by Dr. Howard W. Brayton, assistant pediatrician to the Hartford Hospital, to see an infant practically moribund from the effects of an enlarged thymus gland. The patient was markedly cyanosed and gasping for breath. An x-ray examination showed a thymus filling nearly half the chest. Although roentgen therapy was recommended, as up to this time it had proved to be the only effective method of treatment, yet partly from an experimental standpoint, and also in view of the fact that with radium

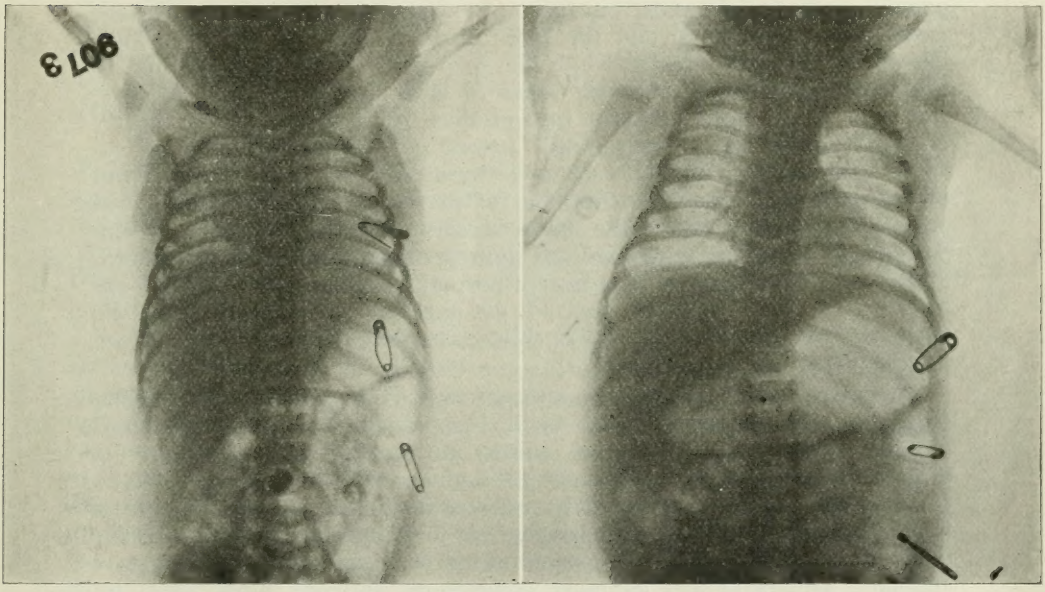

Fig. 6. Case 4. Before Treatment. One Month Later.

I had observed a more rapid diminution in the size of other pathological overgrowths, I departed from the accepted method of treatment, and used radium.

The result was so eminently satisfactory in this case that I have treated all other cases in a similar manner. The technique which was followed was cross-firing with 100 milligrams of radium element, filtered through 0.5 mm. silver, at a half-inch skin tube distance through four portals of entry, the tube being placed over the anterior aspect of the chest directly over the thymus gland. The tube is left two hours in each position, which makes a total dosage of 800 milligram hours. As time is such an important factor in these serious cases I have now substituted 200 milligrams with half the time of exposure.

In my series of 41 cases the dosage administered seemed to be sufficient to cure large as well as small thymic overgrowths in one application, and as now it is conclusively proven that the thymus has no func-

tion after birth, we need not fear over-treatment. None of my cases have shown any tendency to regeneration of the gland. Possibly these results could have been obtained by a single intensive x-ray treatment but in reviewing the literature I find no such results reported.

In conclusion, I want to emphasize the following: Thymic enlargement is a common disease in infants. Radium as well as the roentgen ray is specific in its effect, but radium has the following advantages: It is portable; it gives the desired result in one treatment; it is simple, thus eliminating the dangerous element of fright, as infants resist the fixation necessary in roentgen ray treatment, and this very fixation may be the exciting cause of thymic crisis and death; radium is a safe procedure, as the skin tube distance never varies in the most refractory child.

Case 1. A male infant, 12 pounds in weight, was seen one hour after birth. The labor had been easy but with the first cry the obstetrician had noticed that the child's breathing was decidedly abnormal. The patient presented the most unusual appearance; the skin, lips and nails were intensely cyanotic and the inspiratory stridor was distinctly audible in the adjoining room, while the epigastric retraction was equal to that accompanying the severest forms of laryngeal diphtheria. Percussion and x-ray both indicated the presence of a thymus filling nearly one-half of the chest cavity, while inspection, palpation, and x-ray all revealed the presence of an enormous thyroid occupying the entire front of the neck as far back as the lobes of the ears. Radium was applied and within twenty-fours the baby showed improvement and within forty-eight hours there was decided improvement, which continued until, at the end of a week he was nearly normal in appearance. It was interesting to note that the thyroid disappeared coincidently with the shrinkage of the thymus. The child was still perfectly well fifteen months after discharge.

Case 2. Male, fourteen months of age, with a history of eczema, weakness and convulsions from birth. On close questioning these convulsive seizures were found to consist of the following sequence of events: Sudden asphyxia, cyanosis, retraction of the neck, general clonic contractions, syncopy followed by exhaustion. Examination showed a flabby, eczematous child with bulging of the upper chest and well defined thymic dullness. X-ray corroborated these findings. Radium was applied. The child had no more convulsions and one week later the roentgenogram showed a normal thymic area.

Case 3. A female of eleven months who had always breathed "as though she had a cold." Frequent attacks of choking and cyanosis, particularly at time of feeding. X-ray confirmed the percussion findings of enlarged thymus. One week after treatment the child was perfectly well.

Case 4. Female infant, weighing at birth 10 pounds. Mother primipara with contracted pelvis, requiring extremely difficult high forceps operation. Child's head very much lacerated and left clavicle fractured. Because of these injuries the obstetrician attributed the peculiar breathing of the infant to cerebral pressure. The baby was cyanotic and cried with a peculiar crowing inspiration. Stridor and retraction were present, particularly during nursing and when head was extended. Three days after birth the infant was seen by Dr. Brayton, who found increased thymic dullness and referred the case to me. Five days after treatment the child was free from symptoms and has remained so to date.

REFERENCES

1. SAJOUS. "Analytic Cyclopedia of Practical Medicine."
2. *Am. J. Dis. Child.*, July, 1917.
3. *Am. J. Dis. Child.*, November, 1919.
4. *Boston M. & S. J.*, Dec. 25, 1919.

MEASUREMENT OF RADIUM*

To the Editor:—In the routine testing of hermetically sealed radium preparations, the ionization produced in a given ionization chamber by the penetrating gamma radiation proceeding from the preparation is compared with that produced under the same conditions by the similar radiation from a standard containing a known amount of radium. Mesothorium preparations also emit a penetrating gamma radiation, and consequently by a single comparison with the radium standard in the manner just indicated there is no means for distinguishing such a preparation from one containing only radium and its derivatives.

It is for this reason that the usual radium certificate issued by the National Bureau of Standards contains no statement concerning the actual amount of radium contained in the preparation, but merely a statement of its equivalent radium content. The primary object of the measurement of such preparations by the bureau is to insure the purchaser against any serious error in the radioactive measurement of the preparation.

The carnotites, from which the domestic radium is produced, are known to contain only a negligible amount of mesothorium. Tests made on radium produced from such ore gave no evidence of the presence of mesothorium, and were such as to indicate that the mesothorium present cannot exceed 0.2 per cent. of the radium content of the material. Consequently, it is quite safe to assume that the radium produced from these deposits will be practically free from mesothorium unless the latter product is deliberately added. This is a matter over which the producer has control and concerning which he can speak with confidence. It is customary for the domestic producers of radium to guarantee that their product is practically free from mesothorium, and such a guarantee might well be requested by the purchaser.

Although the examination of a hermetically sealed radium preparation for the presence of mesothorium forms no part of the routine measurement of such materials by the bureau, such examination will be made when requested under conditions that justify the work. These examinations are laborious, require the opening of the preparation and the removal of some of the salt, and involve the risk of a considerable loss of material. As in the case of all tests made by the bureau, the applicant must furnish the material used, assume the risk of loss, and pay a fee commensurate with the labor involved.

On the other hand, even without the examination the purchaser is not left entirely to the mercy of unscrupulous dealers. Repeated gamma ray comparisons, using radiations filtered through different thicknesses

*A letter to the Editor of the Journal of the American Medical Association, republished by permission from the June 19th, 1920, issue of the Journal of the American Medical Association.

of lead, will in general furnish data from which it can be determined whether much of the radiation from the preparation is due to mesothorium. Such tests on sealed specimens are deliberately made from time to time, and similar but less complete data are incidentally obtained from many specimens in the routine course of the testing. In no case has such test revealed to us the presence of mesothorium in any preparation that has been submitted to this bureau as one free from mesothorium; but few imported preparations have been so tested.

Another check on the possible presence of a significant amount of mesothorium in a radium preparation is afforded by its measurement. If the preparation contains a significant amount of mesothorium, then a second measurement made several months after the first will reveal:

1. A growth in the intensity of its radiation if all radiothorium had been removed from the material shortly before the first measurement.

2. Little or no growth if the radiothorium was last removed two or three years before.

3. A decrease of the radiation if the radiothorium had not been removed for over three years.

It is evident that unless the two measurements are very specially related to the age of the contained mesothorium, they will reveal its presence.

In the course of its work, the bureau has to its knowledge remeasured forty-seven radium preparations after intervals varying from two weeks to four years. Preparations from three domestic producers are included in the list. Some of these preparations were resubmitted by their producers, others by their purchasers. For fifteen of the preparations, the interval between these measurements exceeded six months. In no case did the difference between the two measurements exceed the sum of the allowable uncertainties of the two measurements. Excepting a single case in which the initial determination was known to have an unusually low precision, a difference as great as 0.9 per cent. was found in only one instance. The average difference was 0.34 per cent. The second measurement usually, but not always, exceeded the first. This probably results from the fact that in many cases the radium had not fully attained its equilibrium at the time of the first measurement. Even thirty days after the radium preparation is sealed, it is 0.45 per cent. short of its maximum gamma radiation.

Whence it is seen that as yet we have found no indication that any hermetically sealed preparation offered by a domestic producer as a radium preparation contains an appreciable amount of mesothorium. Very few such specimens offered by small dealers, jobbers or importers of radioactive material have been submitted to the bureau. Consequently we are at present not prepared to express an opinion concerning the material obtained from such sources.

S. W. STRATTON, PH. D., Washington, D. C.,
Director, Bureau of Standards.

AMERICAN RADIUM SOCIETY

The following report was presented by the Research Committee at the New Orleans meeting and was approved for publication.

The Committee recommends as important the following:

1. Keeping records of all cases treated.

1st page—short history, diagnosis, grouping based on physical findings.
2nd page—

Case No.	Date of Treatment	Amount of Element or Emanation Screening	Duration	Total mg. hrs or mc. hrs.

2. Grouping of Cases—
   A. Operable.
   B. Borderline or doubtfully operable.
   C. Inoperable.
   D. Advanced and backward.
   E. Resurrences—(Local, Regional).
3. Delimitation of erythema skin dose of each tube of radium. The erythema skin dose should be the standard of comparison of sensitiveness of the various elementary and diseased tissues.
4. The methods of screening and protection of healthy tissues surrounding—a. distance; b. material used.
5. The importance of post-mortem examinations and serial sections of organs in toto, this being the only means to determine the correctness of the technic and the actual permeability of the rays, thereby establishing the actual therapeutic value of radium rays.
6. The re-examination of all patients at stated intervals and careful recording of subjective and physical findings at each examination (both visible and palpable).

REVIEWS AND ABSTRACTS

Russell H. Boggs, M.D. (Pittsburgh). Radium and Roentgen Treatment in Malignancy. The Journal of Radiology, 1, 1-16, Jan., 1920.

"The reason for incompetent therapy is that many are just beginning to use radium and in so many places the roentgen rays are employed by inexperienced operators. While radiotherapy is not a new subject it is new to many, and for some reason or other it seems to be a difficult subject to master. Of course some are taking up this line of work without any, or with very little, preparatory study of either agent or malignancy itself. A comprehensive study of malignancy is essential to either surgeon or radio-therapeutist before he treats malignant growths. He should know the origin of the growth, its type, duration and mode of extension, also the cause of death, in order to give the patient the greatest amount of palliation in hopeless cases. A good surgeon very often does very poor work in this line just the same as a good roentgenologist along other lines does very poor therapy."

"It is true that a large percentage of malignant cases are not treated intelligently either surgically or radiotherapeutically. Today many are giving radiotherapy as a placebo when real treatment is needed, and many are operating on cases past the borderline where surgery is contraindicated, making their patients worse instead of even giving

palliation. The treatment of malignancy is really a specialty in itself, at least from the clinical and consultant side. A surgeon may be able to operate after consulting with some one who has had clinical experience, the same as a radiotherapeutist may be able to give the treatment after consulting with some one of experience; in fact, the treatment of malignancy is a side issue with most surgeons and radiotherapeutists. Many of them know very little about metastases and a large proportion do not know whether operation is indicated or not. This is shown by the number of recurrences following early operations and the futile attempt to remove borderline and advanced cases. Some surgeons and roentgenologists who have better judgment are realizing this fact. Inefficient treatment has so often led to a fatal ending that no one inexperienced should employ any method of treatment for even the smallest lesion, no difference whether it is a superficial epithelioma, a tumor of the breast or ulceration of the cervix."

"It is a well known fact that cutting out the center of a malignant growth is poor surgery, the same as radiotherapy is useless in the treatment of a local lesion, omitting the lymphatic chains which have metastasized. Eradicating every malignant cell is always a difficult problem by any method. Most radiologists as well as most surgeons are satisfied with the removal of the visible part of the disease, thereby losing valuable time and often allowing a patient to pass from a curable into an incurable state. In fact, too many have been satisfied with their own method of treatment. We have not found the real cure for cancer, but really the only step in advance during the last quarter of a century has been radium and the roentgen rays. Ultra radical operations for recurrences are seldom ever indicated. Raying should be done in order to stop cancer cell proliferation, and if all the cancer cells cannot be eradicated by radiation, then the remaining latent cancer tissues should be removed surgically or by electric-coagulation. In such cases, treatment of the lymphatics is very important and must be done by large quantities of radium or heavy filtered rays with the proper amount of crossfiring."

"Those treating malignancy might be divided into three classes; viz, those who treat the local lesion or growth poorly; those who treat the local lesion properly, but omit or have treated carelessly the metastatic glands; and those who treat the local growth properly but see that the adjacent lymphatics receive the most efficient radiation possible. There are comparatively few in the latter class. Even some surgeons of reputation after operation will send the patient home with a letter to the family physician stating that the patient should receive a Coolidge x-ray treatment over the line of incision once a month for six months, omitting so many lymphatics which in most cases contain cancer cells or will later metastasize. Such treatment is not only useless but there is danger of a roentgen dermatitis occurring by offering such poor advice. This is a daily occurrence. But whose fault is it for such bungling roentgen work? It is because so many give such treatment, and it is incumbent upon us, not the surgeon, to advise the proper radiation. If every one were as careful about his technic as the surgeon is with his aseptic precaution before, during and after operations, the end results in malignancy would be different. The treatment of a local growth depends on the nature and situation of the lesion as well as its stage."

"Metastases and the lymphatics have been more thoroughly understood in late years as the result of investigations of Hanley. He studied the process particularly in connection with cancer of the breast, but the conclusions arrived at may be referred to other organs as well. In studying the method of cancer cells spreading to the lymphatic glands, the normal physiological relationship of the affected organ to the lymphatic system must be remembered. It has been demonstrated that the lymphatic vessels arising in tissue are not all intercepted by the nearest group of glands; the first set may be not invaded and the cancer cells enter the glands of a more distant group. It cannot be said positively of any malignant growth, however early, that it has not yet produced metastases in the glands. This fact has a most important bearing on the treatment of carcinoma. Therefore, the importance of the exact knowledge of the distribution of the lymphatic vessels and glands cannot be overestimated. We have no means of determining the limitations of metastases and the extent of invasion of the lymphatic vessels. In practice, we must regard every case of cancer as one in which the lymphatic glands may be affectel and give radium and roentgen treatment accordingly."

"While it is, therefore, universally conceded that either radium or the roentgen rays is the method of choice in the treatment of epithelioma, yet radium has certain advantages, one being that radium can be inserted into the diseased tissue. Superficial epithelioma of the upper part of the face, before it involves cartilage or bone, is very amenable to radiation, but when the tissues are infiltrated it is more difficult to secure healing which will be permanent. When an epithelioma is situated on the mucous membrane it is more resistant to treatment and the glandular tissue is invaded early. If caustics have been employed, the cartilage is usually involved and it is much more resistant to treatment, and recurrence is more likely. Then, radiation to be successful must be thorough, and it requires more intensive radiation. Here, inserting radium needles is very valuable. When a case is clinically cured, unless the scar is smooth and pliable, there will nearly always be a recurrence. In these cases more radiation must be given or else the unhealthy scar be removed by some other method."

"When epithelioma of the lower lip, both early and late, are treated thoroughly by radiation, the treatment including both sides of the neck, equal or better results are obtained than by extirpation. Epithelioma of the lower lip is a serious condition, and radiation, when employed, must be given in such a manner as to destroy all cancer cells in the local lesion and the adjacent lymphatics. When so given, over 90 per cent of the early cases should be cured without producing any deformity, more advanced cases are cured and the hopeless cases receive more palliation than by any other method."

"The objection to surgical removal is the frequent recurrence in the scar, because the operation on the glands cannot be sufficiently complete, no matter how thoroughly the dissection has been carried out. The removal of the submental, part of the parotid, submaxillary and all the glands which metastasize together with the ligation and excision of the jugular is no easy task; besides cancer cells are often left in deeper glands which cannot be reached. This may seem very radical to those who are not familiar with results in early surgical removal, even when radically performed. It has been shown that a recurrence takes place in over 50 per cent of the cases in which there are no palpable glands

at the time of operation, and in over 75 per cent in which there is any glandular involvement whatever."

"The results of radium therapy of buccal lingual and pharyngeal cancer are ofttimes brilliant and other times disappointing. Experience warrants the consideration of radium in every case, whether alone in small lesions, are so prone to recur locally and the adjacent glands so early invaded, radiotherapy should follow even the excision of the smallest growth. In malignant growths in the mouth and throat, the writer has found that the best end results are produced when caustic doses of radium are used with radiation of the lymphatic glands to be followed by electric coagulation of the local lesion. The advantages of electric coagulation are the destruction of tissue without opening the blood and lymph vessels, and the prevention of dissemination which might occur with a cutting operation. The large amount of carcinomatous tissue which can be destroyed by electric coagulation without hemorrhage is an item of great importance, and compels serious consideration by those who have treated many malignant cases. Burying radium needles in lesions of the mouth and throat is a very valuable method of treatment and lately I have had curved needles made for this purpose."

"Percentage of cures of cancer of the cervix by operation are disappointingly low, while the results by operation in carcinoma of the fundus are very good. During the last few years it has been realized that cures by the standard hysterectomy are comparatively few and that the high mortality restricts the usefulness of the Wertheim or radical operation. It has been stated that not more than 15 per cent. of the cases of cancer of the cervix come early enough to be benefited by the standard operation; that is, before induration of the broad ligaments or extension of the disease into the pelvic glands has taken place, and in only sixty to seventy-five per cent it is justifiable to do a radiacl operation. When these facts are considered and since radium has become of such service both as a curative and palliative agent, we must pay more attetntion to this branch of therapy, because there will be only a very few gynaecologists give the subject sufficient attention to do competent work. A review of the literature will show that the most efficient treatment is not being given. The radium work done by the different operators might be compared to a standard hysterectomy where only early cases are cured by local application of a small amount of radium, and to the radical operation where more advanced cases are cured, not only by treating the local growth, but the abdominal and pelvic glands, by large quantities of radium or by from twenty-five to fifty x-ray treatments. A radium plaque containing a few radium tubes placed over the lower abdomen or three or four roentgen exposures is certainly very incompetent treatment."

"Extension of the cancer cells into the parametrium and pelvic lymphatics from uterine carcinoma has been studied by many and in giving a prognosis as well as in giving the treatment, the importance of cancer dissemination must not be overlooked. Recent studies have shown there is no dependable relation between the size of the primary growth and the presence or absence of metastases. It has been stated that in forty per cent of inoperable carcinoma of the cervix the pelvic nodes are free from metastases. This would account for some of the brilliant results, because even local radium treatment properly given appears to destroy cancer cells at a greater distance than can be reached surgically. Janeway states: "Our present evidence indicates that radium destroys

the disease at a greater distance than the knife is capable of removing it, and does this with no risk or inconvenience to the patient." Kelly states: "Recent studies have shown that in from thirty to fifty per cent. of operative cases of cancer of the uterine cervix the disease has formed metastases into the pelvic nodes." Similar statements have been made by other surgeons. Since it is the general opinion that the removal of the pelvic lymph nodes has very little curative value, we should develop an efficient method of radiating the lymphatics. Unfortunately, we are unable by any clinical test to determine whether or not there is an extension into the pelvic lymphatics. Therefore, the only safe procedure is to ray the pelvic glands in all cases of the stage of the disease."

"Radium is indicated as a palliative measure for hopeless inoperable and recurrent cases, for operable cases when operation is contra-indicated and prophylaxis after surgical removal. Lately radium is being used by some for primary cases in carcinoma of the cervix when the disease extends into the cervical canal, because nearly all these cases are followed by recurrence, even in the early cases. These cases can be promptly cured by radium, and time alone will tell whether radium alone, without operation, is advisable."

"Radium is a specific palliative in inoperable cancer of the uterus. It will clinically cure about one-third of the cases and subjective improvement is noticed in a certain percentage of the others. However, recurrence takes place in many of these clinically cured cases within two or three years. The patient during this time regains normal health and can lead a useful life. If a recurrence takes place, as a rule the patient suffers little in comparison with those who had no radium treatment. In these hopeless cases, the offensive discharge and hemorrhage usually completely disappears within from two to four weeks. The cessation of discharge, which often is so offensive to the family and even to the patient, is a remarkable feature. The local condition changes in character within from two to four weeks after the treatment; the mass begins to contract and shrink, and continues to decrease in size. This is more marked in some cases than in others, the growth having entirely disappeared within two months. Today most surgeons consider the operation incomplete, except in the very early cases."

"The prognosis and treatment of cancer of the breast is difficult. The questions arising are mainly three: If the growth disease runs a natural course, how long will the patient live? After removal surgically, what is the chance of recurrence? How many more cases can be cured by emploping radium or the roentgen rays as an antioperative or post-operative procedure, and how much palliation can be given by competent radiation in inoperable cases? Without treatment the natural course of the growth depends on whether it is of the medullary or schirrus form. The former will usually terminate in a few months, while the scirrhus cancer develops slowly and the expectation of life is at least from two to four years. A prognosis of non-recurrence after operation depends on the stage of development as well as the form of tumor at the time of operation. Today many are operating on advanced cases and expect the same results that the leading authorities claim in early cases. Except in the very early cases where the disease is localized in the breast, the outlook is hopeless as far as the end results are concerned, and today it is a question whether operation does not hasten rather than retard the process when a cure cannot be obtained surgically."

"The surgical opinion is that, with a small localized mass in the

breast, the patient can be assured that a cure can be expected in four out of five cases; that is, when there is a microscopic freedom of cancer cells found in the adjacent lymphatics. When the adjacent lymphatics are found to contain cancer cells microscopically, the chances of a cure are at once diminished to one in five. When you state that cancer is found only by the microscope, that is an entirely different proposition from the cases where the axillary glands are palpably enlarged from metastases, because in the latter case the cancer growing edge is away beyond the reach of the knife. Until this is universally recognized by both the surgeon and radiotherapeutist and the patients are treated accordingly the highest percentage of cures will not be obtained or the greatest amount of palliation will not be given to the patient. When the cancer growing edge has reached beyond the surgical mark the patient may be cured by anti-operative radiation. Halstead found death from metastases in 32.4 per cent. of the cases even with a microscopically negative axilla. This should be sufficient to show every radiotherapeutist how incompetent a few treatments over the line of incision, axilla and supra-clavicular glands are, and to show the surgeon that they cannot expect a cure surgically when the cancer growing edge is beyond the reach of the knife. Therefore, in anything except the very early cases radiotherapy is the most important part of the treatment. It has taken a long time for both to realize this fact. It is also realized that our present day therapy as it is generally given has only a slight palliative effect, and until better therapy is done the best end results will not be obtained. At least twenty per cent of the cases that reach the three year limit die later of recurrence."

"It is difficult to determine the real value of anti- or post-operative radiation because so much of the work has been done in such an incompetent manner and there is no way to visualize or palpate all of the metastases at the time of operation. But it is beyond dispute that a patient is in better shape for operation after cell proliferation is checked by radiation and that many recurrences are prevented by competent radium or roentgen treatment after operation. The marked palliation in hopeless and recurrent cases is appreciated by everyone. Therefore, radiation has taken a very important place in the treatment of carcinoma of the breast, and we should see that more competent work is done. The cancer-bearing area or microscopic edge of cancer of the breast is often from one and one-half to two feet extending from neck downward. It must be remembered that there are twenty or more lymphatic chains connected with the breast which will later metastasize if the cancer cells have not all been eradicated."

"In an article published, "The Post-Roentgen Treatment of Carcinoma of the Breast," read before the American Roentgen Ray Society, New York City, September 22, 1917, I described the areas or lymphatics which should receive treatment together with the technic used at that time. At present slightly more skin areas are employed and in many cases six and ten millimeters of aluminum are used instead of four and the axillary and sub-clavicular glands are treated with a number of radium tubes, the reason for which will be described later."

"The technic in the treatment of malignancy is far from being perfect. We have been trying to develop a method by which all cancer cells can be eradicated in every case. Such is hardly possible, but there still remains much to be done. Each year we are treating successfully cases which did not respond to our former treatment. Improvements in meth-

ods have made treatment of every type of malignancy, ranging from a superficial epithelioma to carcinoma of the breast or uterus, more efficient."

"It is indeed much more rare to see a roentgen ulcer produced than was when everyone who had a machine treated epitheliomas. But we do see many cases of epithelioma, particularly of the mouth and throat, which have been treated in a careless manner either radiotherapeutically or surgically, thereby losing valuable time and often tissue changes taking place which makes further treatment useless. It must be remembered that normal tissue will stand just so much radiation and it can be repeated only a few times. The following case will illustrate: A patient had carcinoma of the throat and was treated externally by roentgen rays by two different operators, each claiming to have given a full erythema dose within two weeks and no treatment was given to the local growth. So when he came under my care, I could not safely treat the glands of the neck. Only the local lesion in the throat was treated which disappeared within four weeks, but while I was waiting for a severe reaction from the x-ray treatment, a gland enlarged at the angle of the jaw. These two x-ray treatments were inefficient because no reaction appeared and the hair was not removed."

"Burying radium and the proper use of electric coagulation have changed the results in cancer of the mouth and throat; but the question arises, should either be done until the lymphatics of the neck be treated by surface applications of radium to check cell proliferation. It is a question whether the deep glands containing metastastic cancer are sufficiently influenced by the ordinary roentgen rays or radium treatment and by the usual amount of cross-firing. It is true that it requires a large amount of radiation to cause the disappearance of all cancer cells even in the lymphatic glands, rather superficially situated in the neck or axilla. The treatment ordinarily given will stop cell proliferation but, if the glands are removed and examined, a latent cancer is found."

"By using ten millimeters of aluminum and by using the highest possible penetration, superficial nodules will disappear that are only reduced in size under ordinary treatment. The same is true by using a number of radium tubes so placed as to give rather homogeneous radiation, as the radiation comes from many points instead of a focal point as it does with a roentgen tube. This is a method of cross-firing and is useful in treating glands in the neck and under the clavicle where cross-firing from a single focal point is difficult. There is less loss from absorption from a filtered radium pack than there is from our present day Coolidge tube. The treatment of the lymphatic glands which are known to metastasize is a difficult task and one which has not received sufficient attention. It has become generally recognized that it requires more radiation to destroy cancer cells than it does to destroy sarcomatous tissue and that squamous carcinoma is not affected by the same amount that will destroy basal cell carcinoma."

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Recasens: The Technique of Applying Radium in the Various Types of Cancer of the Cervix of the Uterus. Arch. mens. d'obst. et de gynec., 1919, viii, 676, International Abstract of Surgery, p. 468, Surgery, Gynecology and Obstetrics, June, 1920.

"Recasens reports nearly 400 cases of cancer of the uterine cervix treated with radium which he has observed since 1913. From these

cases, which he has followed for six years, he draws the following conclusions:"

"1. In cancer of the uterine cervix the treatment of choice is non-surgical. Radium therapy gives results superior to those obtained by any other means."

"2. Cervical cancers in which the activity of the epithelial cells is strongest are those which yield to radium treatment best."

"3. Dosage and filtration are of the utmost importance in the treatment of cancers of the uterine cervix with radium."

"4. For cancers of the excrescent or papillary form active radiation is best. In such cases filtration may be reduced to 1 mm. and even less if the tube is placed in such a position that it is completely surrounded by the cancer."

"5. Ulcerous forms require stronger filtration and larger dosage."

"6. In superficial uterine cancers which extend to the vagina, and in all laminated forms of cancer, plates similar to those used for skin cancers should be used rather than tubes."

"7. Infiltrating and nodular types of cancer require very strong filtration and very large doses of radium."

"8. Very marked hypoleukæmia is a contra-indication to radium treatment. Even when the condition is slight, the dosage must be reduced."

"9. Advanced cachexia is an absolute contraindication to radium therapy."

"10. Medium doses of radium repeated every eight or ten days are tolerated better than stronger doses at greater intervals."

"11. Radium therapy should always be associated with roentgen therapy in the treatment of cancer of the uterine cervix."

"A large number of inoperable cases treated by Recasens may be considered cured since they have not shown any signs of recurrence in from three to five years. About 30 or 40 per cent of the patients treated are not benefited."

NOTES AND COMMENTS

THE RADIUM HOSPITAL OF OMAHA

A new hospital to be called the Radium Hospital of Omaha, has been opened at Omaha, Nebraska, under the direction of Dr. D. T. Quigley. The hospital is completely equipped for the treatment of all conditions in which radium therapy alone or combined with other measures such as surgery, electrical methods, is indicated. The hospital contains fifty splendidly furnished rooms, and is one of the largest of its kind in the world. Dr. Quigley's many years' experience in radium therapy assures the success of the work.

* * * *

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